

TPS6125xEVM

This user's guide describes the characteristics, operation, and use of the TPS6125x evaluation module (EVM). This EVM enables test and evaluation of the Texas Instruments' [TPS61254](#) and [TPS61256](#) (TPS6125x) devices, a series of 3.5-MHz, up to 5.5-V, step-up dc-dc converters. This user's guide includes EVM specifications, the schematic diagram, bill of materials, and board layout.

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1 Introduction

The TPS6125x device provides a power-supply solution for products powered by either a three-cell alkaline, NiCd or NiMH battery, or a single-cell Li-Ion or Li-polymer battery. The wide input voltage range is ideal for portable power applications such as mobile phones or computer peripherals. In addition, the TPS6125x can also maintain its output biased at the input voltage level. In this mode, the synchronous rectifier is current-limited, and allows external loads (for example, an audio amplifier) to be powered with a restricted supply. In this mode, quiescent current is reduced to 18 μ A. Input current in shutdown mode is less than 5 μ A in order to maximize battery life.

1.1 Requirements

The TPS6125xEVM is designed to operate over the full input voltage range and produces a fixed output voltage. Refer to [Table 1](#) for fixed output voltage version options.

In order to operate this EVM, only a dc power supply able to deliver between 2.3 V and 5.5 V is required.

1.2 Applications

- USB Host Supplies from a Single Li-Ion Battery
- USB Dedicated Charging Port Supply
- Li-Ion Applications
- Audio Applications
- RF-PA Buffers

1.3 Features

- Up to 92% Efficiency
- V_{IN} Range from 2.3 V to 5.5 V
- 18- μ A Quiescent Current in Standby Mode
- 30- μ A Quiescent Current in Normal Operation
- 100% Duty-Cycle Mode when $V_{IN} > V_{OUT}$
- Selectable Standby Mode or True Load Disconnect During Shutdown
- Double-sided, two-active-layer printed circuit board (PCB) with all components on top side
- Active converter area of approximately 25 mm²

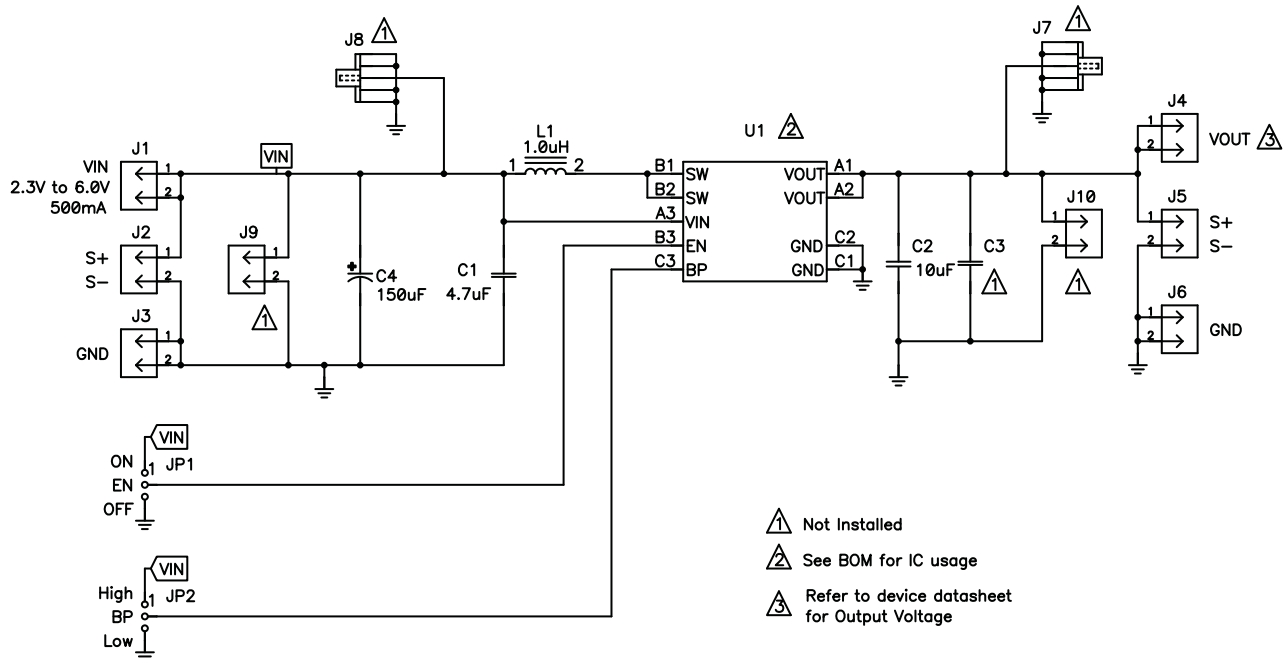
1.4 EVM Ordering Options

Table 1 provides the ordering Information for the various EVM options.

Table 1. TPS6125x Output Voltage Options and Ordering Information

Orderable EVM Number	Device Part Number	Output Voltage
HPA711-001	TPS61254	4.5 V
HPA711-002	TPS61256	5.0 V

2 TPS6125xEVM Schematic



For reference only; see Table 2 for specific values.

Figure 1. TPS6125xEVM Schematic

3 Connector and Test Point Descriptions

3.1 Input Connectors

3.1.1 J1: VIN

This header is the positive connection to the input power supply. The power supply must be connected between these pins and J3 (GND). Twist the leads to the input supply and keep them as short as possible. The input voltage must be between 2.3 V and 5.5 V.

3.1.2 J2: Input Sense Connector

This header is intended to measure the input voltage directly on the input capacitor. Therefore, a four-wire power and sense supply can be connected. Twist the leads to the sensing connector.

3.1.3 J3: GND

This header is the return connection to the input power supply. Connect the power supply between these pins and J1 (VIN). Twist the leads to the input supply and keep them as short as possible. The input voltage must be between 2.3 V and 5.5 V.

3.2 Output Connectors

3.2.1 J4: VOUT

This header is the positive connection of the output voltage. Connect the load between these pins and J6 (GND).

3.2.2 J5: Output Sense Connector

This header is intended to measure the output voltage directly on the output capacitors.

3.2.3 J6: GND

This header is the return connection of the output voltage. Connect the load between these pins and J4 (VOUT).

3.3 Other Connectors

3.3.1 J7: SMA Output Connector

This SMA connector is connected to the output voltage of the converter. It can be used to easily analyze the noise spectrum of the output voltage with a spectrum analyzer. By default, J7 is not assembled on the EVM.

3.3.2 J8 SMA Input Connector

This SMA connector is connected to the input voltage of the converter. It can be used to easily analyze the noise spectrum of the input voltage with a spectrum analyzer. By default, J8 is not assembled on the EVM.

3.4 Jumpers

3.4.1 JP1: Enable Jumper

Placing a jumper across pins EN and ON ties the EN pin to VIN, and enables the device. Placing a jumper across pins EN and OFF ties the EN pin to GND, which disables the device.

3.4.2 JP2 Bypass

JP2 is the operating mode selection pin of the device and is only of relevance when the device is disabled (EN = low). Placing a jumper between BP and Low selects shutdown (that is, true load disconnect mode); thus, the device is in shutdown mode when EN is pulled low.

Placing a jumper between BP and High selects bypass mode. The output is biased at the input voltage level with a maximum load current capability of approximately 150 mA when EN is pulled low. In this mode, the device consumes only a standby current of 18 μ A (typ).

4 TPS6125xEVM Assembly Drawings and Layout

Figure 2 through Figure 6 show the design of the TPS6125xEVM-711 PCBs. The EVM has been designed using a four-layer, 1-ounce copper-clad PCB with all components in an active area on the top side of the board. Moving components to both sides of the PCB can offer additional size reduction for space-constrained systems.

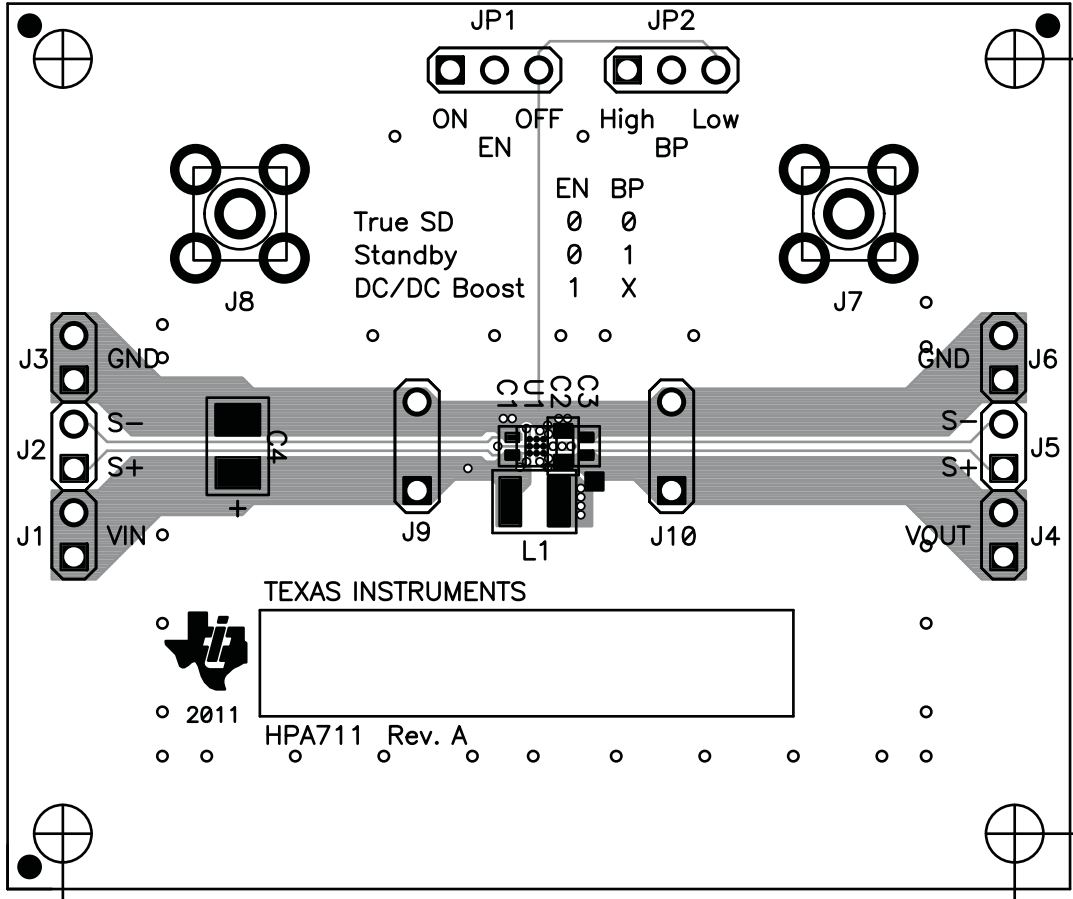


Figure 2. TPS6125xEVM Component Placement (Viewed from Top)

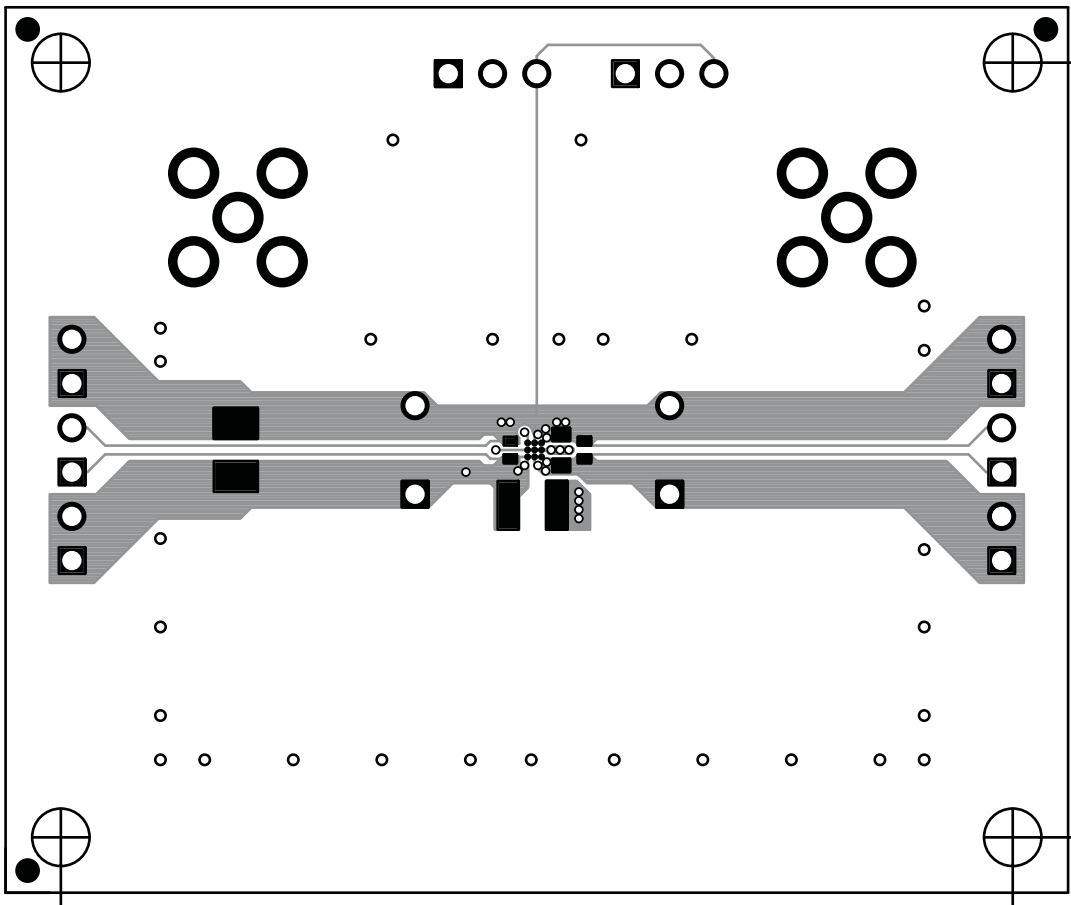


Figure 3. TPS6125xEVM Top Copper (Viewed from Top)

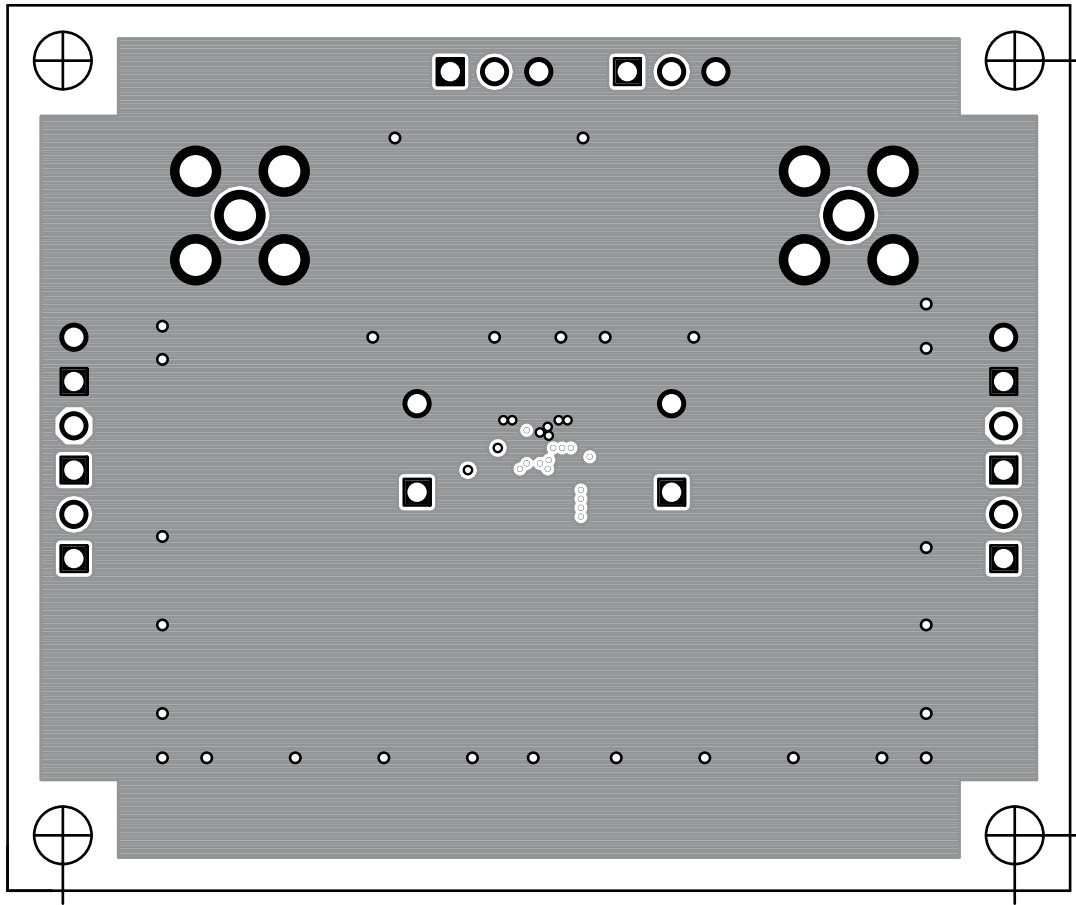


Figure 4. TPS6125xEVM Inner Layer 1 (Viewed from Top)

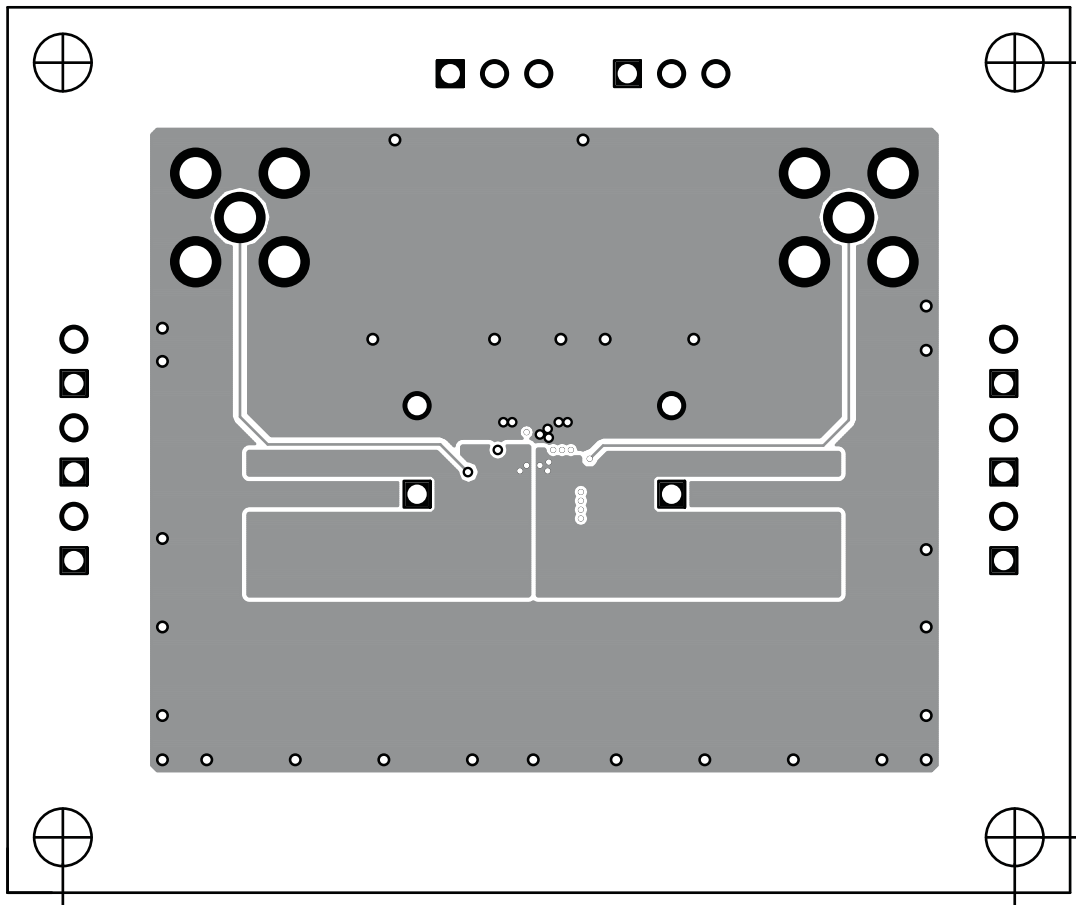


Figure 5. TPS6125xEVM Inner Layer 2 (Viewed from Top)

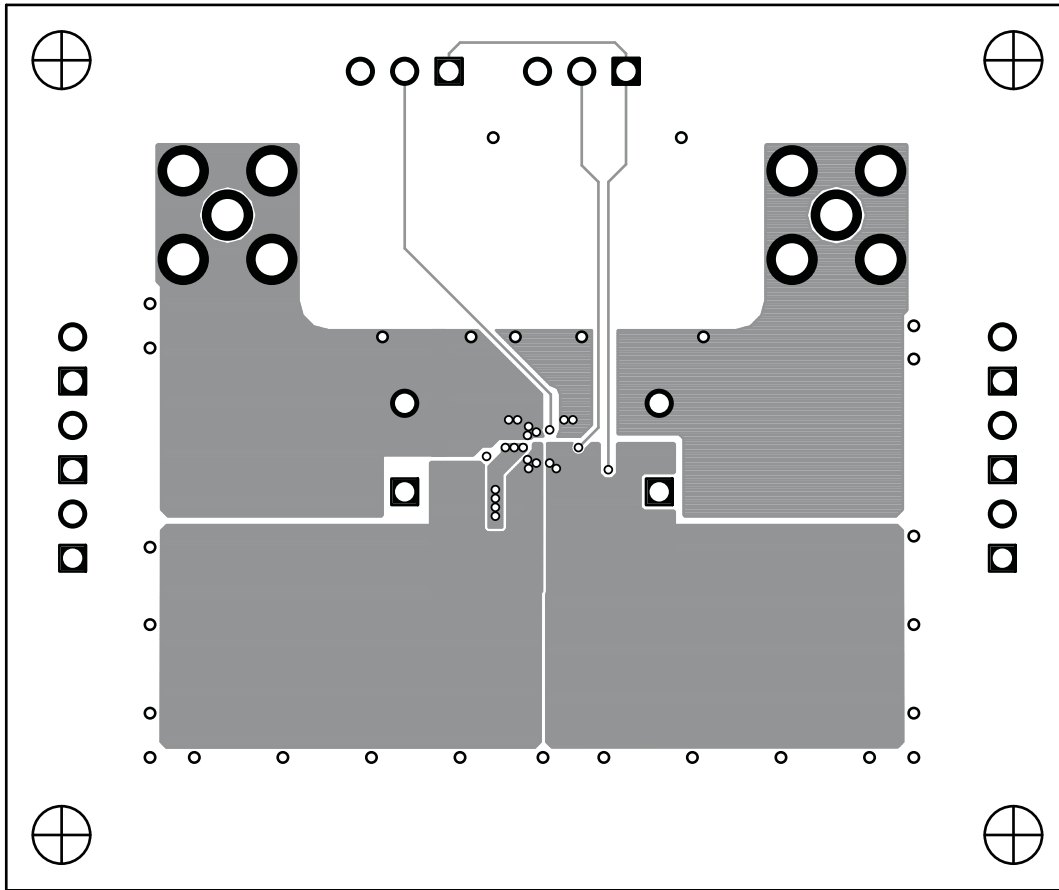


Figure 6. TPS6125xEVM Bottom Copper (Viewed from Bottom)

5 List of Materials

Table 2 lists the EVM components as configured according to the schematic shown in Figure 1.

Table 2. TPS6125xEVM Bill of Materials

Count		RefDes	Value	Description	Size	Part Number	MFR
-001	-002						
1	1	C1	4.7 μ F	Capacitor, ceramic, 10 V, X7R, 20%	0402	GRM155R60J475U	Murata
1	1	C2	100 μ F	Capacitor, ceramic, 50 V, X7R, 20%	0603	GRM188R60J106ME84D	Murata
0	0	C3	—	Not installed	0605		
1	1	C4	150 μ F	Capacitor, Tantalum, 6.3 V, \pm 20%, 70 m Ω	3528(B)	T520B157M006ATE070	Kemet
1	1	L1	1.0 μ H	Inductor, SMT Multi-layer, 1.8 A, 50 m Ω	0.118 x 0.118 inch	LQM32PN1R0MGOL	Murata
1	0	U1	TPS61254YFF	IC, Tiny Boost Converter, 4.5 V	BGA	TPS61254YFF	TI
0	1	U1	TPS61256YFF	IC, Tiny Boost Converter, 5.0 V	BGA	TPS61256YFF	TI

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User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

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